Notice of Allowability	Application No.	Applicant(s)	
	09/844,567	STRANO ET AL.	
	Examiner	Art Unit	
	Krishnan S Menon	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *amendment of 8/8/03*.
2. ☒ The allowed claim(s) is/are *1-37*.
3. ☒ The drawings filed on *27 April 2001* are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.
5. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
   (a) ☐ The translation of the foreign language provisional application has been received.
6. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE**

7. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

8. ☐ CORRECTED DRAWINGS must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No. ____.
   (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the Examiner.
   (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet.

9. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1☐ Notice of References Cited (PTO-892)
3☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
5☐ Information Disclosure Statements (PTO-1449), Paper No. ____.
7☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
2☐ Notice of Informal Patent Application (PTO-152)
4☒ Interview Summary (PTO-413), Paper No.____ .
6☒ Examiner's Amendment/Comment
8☒ Examiner's Statement of Reasons for Allowance
9☐ Other

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Daniel C. Mulveny on 10/22/03.

The application has been amended as follows:

CLAIM AMENDMENTS:

1. (Currently amended) A supported mesoporous carbon ultrafiltration membrane comprising:

(a) a support having at least one through-pore; and

(b) a mesoporous carbon material having a polymeric precursor composition comprising a carbonizing polymer and a noncarbonizing templating polymer attached to the support and filling at least a portion of the at least one through-pore, the mesoporous carbon material in the at least one pore having a pore size distribution mode in the mesoporous range of 2 nm to 50 nm.

2. (Original) The supported mesoporous carbon membrane of claim 1, wherein the support is stainless steel.

3. (Original) The supported mesoporous carbon membrane of claim 1, wherein the support has a through-pore size of from about 0.1 to 100 μm.

4. (Original) The supported mesoporous carbon membrane of claim 1, wherein the support has a through-pore size of about 0.2 μm.

5. (Previously amended) The supported mesoporous carbon membrane of claim 1, wherein the membrane has a through-pore size distribution of from about 2 nm to 100 nm.

6. (Previously amended) The supported mesoporous carbon membrane of claim 1, wherein the membrane has an effective through-pore size of from about 2 nm to 50 nm.

7. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane has a maximum operating pressure of 1000 psig.

8. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane has a maximum operating temperature greater than 200°C.

9. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane has a water permeance of from 4.4×10^{-08} to 2.4×10^{-05} $g/s/m^2/Pa$.

10. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane has a BSA retention greater than 75 percent.

11. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane has a BSA retention greater than 85 percent.

12. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane has a BSA retention greater than 95 percent.

13. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane has a BSA retention greater than 98 percent.

14. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane is in the shape of a tube.

15. (Original) The supported mesoporous carbon membrane of claim 1, wherein the membrane is in the shape of a flat disc.

16. (Currently amended) A supported mesoporous carbon ultrafiltration membrane comprising a mesoporous carbon material and a support, the mesoporous carbon material having a polymeric precursor composition comprising a carbonizing polymer and a noncarbonizing templating polymer, and having a pore size distribution mode in the mesoporous range of 2 nm to 50 nm, and the support having at least one through-pore in the macroporous range of 0.1 to 100 μm, wherein the at least one through-pore of the support has a pore wall, and said mesoporous carbon material is in contact with at least a portion of the pore wall.

17. (Original) The supported mesoporous carbon membrane of claim 16, wherein the support has a plurality of through-pores in the macroporous range of 0.1 to 100 μm, and wherein a portion of the mesoporous carbon material is located within all of the through-pores in the support that are in the macroporous range.

18. (Original) The supported mesoporous carbon membrane of claim 16, wherein the mesoporous carbon material is prepared by a process comprising the steps of:

(a) applying a polymeric precursor mixture comprising a carbonizing polymer precursor and a noncarbonizing template polymer precursor to the pore wall of the at least one through-pore of the support to form a coating on said pore wall that at least partially fills said at least one through-pore of the support; and

(b) pyrolyzing said coating to form the mesoporous carbon material.

19. (Original) The supported mesoporous carbon membrane of claim 18, wherein the carbonizing polymer precursor is poly(furfuryl alcohol) and the noncarbonizing template polymer precursor is poly(ethylene glycol).

20. (Original) The supported mesoporous carbon membrane of claim 18, wherein the weight ratio of carbonizing polymer precursor to noncarbonizing template polymer precursor in the polymeric precursor mixture is from about 1:3 to 3:1.

21. (Original) The supported mesoporous carbon membrane of claim 16, wherein the membrane is rigid.

22. (Previously amended) The supported mesoporous carbon membrane of claim 16, wherein the membrane has a bimodal pore size distribution with two pore size distribution modes, wherein one pore size distribution mode is in the range of from 2 to 100 nm.

23. (Previously amended) The supported mesoporous carbon membrane of claim 22, wherein the other pore size distribution mode is less than 2 nm.

24. (Currently amended) The supported mesoporous carbon membrane of claim 22, wherein one pore size distribution mode is in the range of from $\geq$ to 50 nm.

25. (Previously amended) The supported mesoporous carbon membrane of claim 22, wherein one pore size distribution mode is in the range of 2 to 10 nm.

26. (Original) The supported mesoporous carbon membrane of claim 16, wherein at least one pore of the support is completely filled with the mesoporous carbon material.

27. (Currently amended) A process for preparing a supported mesoporous carbon ultrafiltration membrane comprising the steps:

(a) applying a polymeric precursor mixture containing a noncarbonizing template polymer and a carbonizing polymer to a portion of a porous support to form a coating of said polymeric precursor mixture on said portion of said porous support, and

(b) pyrolyzing the coating in an inert gas atmosphere to obtain a mesoporous carbon material having a pore size distribution mode in the mesoporous range of 2 to 50 nm.

28. (Original) A process for separating a substance in a liquid comprising filtering said liquid through the supported mesoporous carbon membrane of claim 1.

29. (Original) The process of claim 28, wherein the supported mesoporous carbon membrane is in the form of one or more tubes.

30. (Currently amended) A supported mesoporous porous carbon ultrafiltration membrane comprising a mesoporous porous carbon layer having a pore size distribution mode in the mesoporous range of 2 to 50 nm and a porous support, wherein the porous carbon layer is created by depositing a polymeric mixture comprising a carbonizing polymer precursor and a noncarbonizing template polymer precursor on said porous support and then pyrolyzing said polymeric mixture, and wherein the pore size of the porous carbon layer is controlled by varying the molecular weight of the template polymer precursor.

31. (Currently amended) A supported mesoporous porous carbon ultrafiltration membrane comprising a mesoporous porous carbon layer having a pore size distribution mode in the mesoporous range of 2 to 50 nm and a porous support, wherein the porous carbon layer is created by depositing a polymeric mixture comprising a carbonizing polymer precursor and a noncarbonizing template polymer precursor on said porous support and then pyrolyzing said polymeric mixture, and wherein the pore size of the porous carbon layer is controlled by varying the amount of the template polymer precursor present in the polymeric mixture.

32. (Currently amended) A supported mesoporous carbon ultrafiltration membrane for separating at least one macromolecular substance from a liquid, said membrane comprising:

(a) a support having at least one through-pore which connects a first surface of said support to a second surface of said support; and

(b) a mesoporous carbon material having a polymeric precursor composition comprising a carbonizing polymer and a noncarbonizing templating polymer attached to at least a portion of at least one of said first surface and said second surface of said support;

wherein said mesoporous carbon material has a pore size distribution mode in the mesoporous range of from 2nm to 50nm, and wherein said mesoporous carbon material is also disposed within said at least one through-pore of said support so as to at least partially fill said at least one through-pore of said support.

33. (Previously amended) The supported mesoporous carbon membrane of claim 32, wherein the membrane has a pore size distribution mode in the range of 2 to 100 nm.

34. (Currently amended) A supported mesoporous carbon ultrafiltration membrane comprising:

(a) a support, said support having a plurality of through-pores in the macroporous region of 0.1 to 100 μm; and

(b) a mesoporous carbon material having a polymeric precursor composition comprising a carbonizing polymer and a noncarbonizing templating polymer, said mesoporous carbon material having a plurality of pores in the mesoporous region of 2 to 50 nm;

wherein said mesoporous carbon material is located within the plurality of pores in said support.

35. (Previously amended) The supported mesoporous carbon membrane of claim 34, wherein the membrane has an effective pore size in the range from 2 to 100 nm.

36. (Previously amended) The supported mesoporous carbon membrane of claim 34, wherein the membrane has an effective pore size in the range from 2 to 50 nm.

37. (Previously amended) The supported mesoporous carbon membrane of claim 34, wherein the membrane has an effective pore size in the range from 10 to 30 nm.

Allowable Subject Matter

The following is an examiner's statement of reasons for allowance: The closest prior arts are Foley et al (US 5,972,079) and Lafyatis, et al, "Poly(fufuryl alcohol)-Derived Carbon Molecular Sieves:...", I&EC Research, 1991, 29. Neither references teach a supported meso-carbon ultrafiltration membrane having a pore size distribution in the range of 2-50 nm. Foley et al teach of a supported gas separation membrane having pore size range from 0.3 - 10 nm, but without the templating polymer. Lafyatis et al teach a mesocarbon material comprising a carbonizing polymer and a template polymer, and having pore size distribution in the mesocarbon range. However, it would not be obvious to one of ordinary skill to combine the references to make an ultrafiltration membrane having the mesocarbon structure having or obtained from precursors comprising a templating polymer and a carbonizing polymer because it is the templating polymer that makes the meso-carbon pore size distribution mode possible.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krishnan S Menon whose telephone number is 703-305-5999. The examiner can normally be reached on 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda L Walker can be reached on 703-308-0457. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Krishnan Menon
Patent Examiner

JOSEPH DRODGE
PRIMARY EXAMINER